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NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55101

The Impact of Insects on Second-Year Cone Crops in Red Pine Seed-Production Areas

ABSTRACT. — Second-year cone crops in red pine seed-production areas have been severely damaged by five species of insects. Control of the two most destructive pests could increase present seed yields in most areas by at least 50 percent. Some seed-production areas may not produce harvestable seed crops until cone-insect populations are suppressed.

The National Forest System has established red pine (*Pinus resinosa* Ait.) seed-production areas (SPA's) in most National Forests of the north central United States. These areas were developed from the best natural stands of red pine and are managed solely for the production of seed.

Because insects were apparently reducing seed yields, sampling was begun in 1962 to quantify the impact of insects on the cone crops. Only cones in the second (final) year of development were sampled. This Note summarizes the results of these surveys.

Survey Methods

All cones on one whorl of midcrown branches were collected from a number of trees in half or more of all SPA's. Sample trees were arbitrarily selected in 1962 and 1963 but since then have been randomly selected. The sample size was 5 trees in an SPA in 1962 and 1963, 10 in 1964, and 15 since then. The cones from each tree were bagged and sent to the laboratory where they were dissected and classified according to type of damage. Keys by Lyons (1957b) and Hard (1964) were helpful in identifying the damage.

The Overall Losses

From 34 to 83 percent of the annual cone samples were damaged by insects (table 1). The amount of damage in individual SPA's and the local importance of individual pests may be well above or below the annual averages.

Over the 6-year period five insects have been responsible for most of the cone damage. The two most destructive insects were the red pine cone beetle, *Conophthorus resinosae* Hopkins, and the red pine coneworm, *Dioryctria disclusa* Heinrich. Another coneworm, *Eucosma monitorana* Heinrich, and a pine seedworm, *Laspeyresia toreuta* Grote, ranked next in importance. The cone midge, *Rubsaamenia* sp., infested fewer cones than any of the other insects.

The cone beetle and the two coneworms usually destroy the entire cone so that few or no seeds survive. *Laspeyresia*, on the other hand, feeds only on the individual seeds and rarely destroys all seeds in a cone. Usually there are 1 or 2 *Laspeyresia* larvae per cone, and each consumes 4 to 10 seeds (there are about 40 seeds in a cone) (Lyons 1956, 1957a).

Rubsaamenia feeds primarily on cone scale tissue but may also feed on seeds. Typically, its feeding causes excessive resin flow which usually makes the cone scales stick together, thus hindering seed release.

These are the losses occurring during the second year of cone development. The impact of insects on the first-year conelets is as yet unknown, but the odds are high that their damage is significant.

Losses in Individual Seed-Production Areas

Insect damage to annual cone crops was highly variable both within and among SPA's (table 2). The total range was from 0 to 100 percent. Some consistencies are evident, though, in the midst of this great variability. Some seed-production areas such as Birch Hill and Bearsdale Springs have had consistently greater cone damage than others like Black Creek, Cary Dam, and Ogontz River. The average level of cone damage in the former areas was more than 60 percent but was less than 17 percent in the latter areas. The factors underlying differences in the level of cone damage both among and within SPA's will be explored in another paper.

Table 1. Percentage of sample cones infested by different insects in red pine seed-production areas

Year	Total number cones examined	Number seed-production areas sampled	Percentage cones damaged by: Conophthorus resinosae	Dioryctria disclusa	Eucosma monitorana	Laspeyresia toreuta	Rubsaamenia sp.	Other	Total
1962	262	9	18	15	5	< 1	6	5	49
1963	304	9	25	31	2	5	1	2	66
1964	1,881	7	20	8	2	4	1	< 1	35
1965	1,648	10	28	23	4	8	3	17	83
1966	3,211	14	12	9	2	6	5	< 1	34
1967	2,242	17	18	7	10	8	2	< 1	45

Table 2. Variations in insect-caused damage within and among eight seed-production areas[1]

Seed-production area	Percentage sample cones damaged by insects: 1964	1965	1966	1967	1964-67
Birch Hill	29	86	76	84	60
Black Creek	4	0	15	90	14
Bearsdale Springs	42	99	99	100	88
Cary Dam	22	33	12	15	16
Farr Lake	63	79	100	46	74
Norway Lake	--	84	12	42	31
Ogontz River	--	40	6	57	17
Portage Lake	--	99	100	20	98

[1] Data are presented only for those areas in which collections were made for at least 3 consecutive years.

Conclusions

1. Control of the two most important pests — the red pine cone beetle and the red pine coneworm — during the second year of cone development would increase present seed yields from most SPA's by at least 50 percent.

2. Insect control during the first year of cone development might increase seed yields even further if insects are at all destructive to the first-year conelets.

3. SPA's with consistently high insect damage may not produce harvestable cone crops unless cone insect populations are suppressed.

Literature Cited

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WILLIAM J. MATTSON
Associate Insect Ecologist